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Maesopsis eminii Engl. Musizi

Rhamnaceae Buckthorn family

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HABITAT

Native Range

Maesopsis eminii Engl., commonly known as musizi, grows in a band along the equator (2° S. to 8° N.) in central Africa (*28*). Its native range extends from the Lake Victoria area in Kenya and Tanzania through Zaire and along the Gulf of Guinea as far west as Liberia. Musizi is also found on the island of Sao Tome in the Gulf of Guinea (*7*, fig. 1). The species is managed in natural stands and planted in many areas throughout its native range.

Musizi has gained considerable reputation as a plantation tree and a useful wood. As such, it has spread thoughout the humid tropics. Plantations are reported in Malaysia (*18, 23*), Fiji (*28*), and Indonesia (*13, 27*). Adaptability trials for the species are under way in Puerto Rico (*12*, fig. 2), India (*1*), Western Samoa (*10*), the Solomon Islands (*16*), Sudan (*11*), and Malawi (*24*). In Puerto Rico, the species has escaped and is spreading aggressively from the initial adaptability trial planting sites.

In the African range, musizi is very common in the ecotone between high forest and savanna. It is an agressive seral species colonizing grasslands and disturbed areas within the forest (*6, 7*).

Climate

Musizi is a moist climate species. Its northern limit in Africa roughly corresponds with a limit of 1200 mm mean annual precipitation. The best growing trees in Puerto Rico are found where annual precipitation reaches 3000 mm and where rainfall is either uniform or comes in greater amounts during the summer. A dry season of up to 2 months can be tolerated (*29*). In Uganda, musizi is reported to lose its leaves during the dry season between January and mid-April (*25*). Musizi grows where the mean annual temperature ranges from 22 to 27 °C. Temperatures during the average hottest month range from 26 to 32 °C; the average coldest month temperatures range from 16 to 24 °C (*29*). The species occurs from 100 to 1500 m above sea level (*9, 29*).

Soils and Topography

Although musizi probably makes its best growth on deep, moist, and fertile sandy loam soils (*29*), it is tolerant of a fairly wide range of site conditions. In Malaysia, spectacular growth was observed on sites so poor that many other species had failed (*24*). In Kenya, musizi has been planted on red, lateritic soils (*21*), whereas in Indonesia it is considered suitable only for fertile, well-drained soils (*27*). In Puerto Rican trials, the species was successful on soils ranging from sandy loams to clays and with neutral to very acid pH's. Musizi failed or grew poorly where internal soil drainage was impeded. Where other factors are not limiting, topography is probably unimportant.

Associated Forest Cover

Musizi is an early successional species adept at colonizing grasslands and disturbed areas in the high forest. In the Budu forest of Uganda, musizi and *Piptadenia africana* Hook. f. together constitute 80 percent of the trees (*7*). On the Sese islands of Lake Victoria, musizi is found growing in association with *Uapaca guineensis* (Don) Muell. Arg., *Piptadeniastrum africanum* (Hook. f.) Brenan, and *Canarium schweinfurthii* Engl. (*15*). In the plains high forest or "gallery" forest of equitorial Sudan, musizi is found growing in association with *Khaya grandifoliola* C. DC., *Chlorophora excelsa* (Welw.) Benth. & Hook. f., *Canarium* sp., *Entandophragma* sp., *Chrysophyllum* sp., *Funtumia* sp., and *Mildbraediodendron sp.* (*26*).

LIFE HISTORY

Reproduction and Early Growth

Flowering and Fruiting.—Small yellow-green flowers are produced on small axillary cymes. The flowering period is variable, taking place during April through July in Ghana (*25*) and between November and January in Uganda (*7*). The fruit, a drupe about 2.5 cm long, is yellow when it falls, but on the ground turns dark purple when fully ripe. Its appearance is that of a small plum. The fleshy pericarp is eaten by birds,

Figure 1.—*Distribution of* Maesopsis eminii.

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Figure 2.—*A mixture of planted and volunteer musizi in Puerto Rico.*

particularly the toucan, as well as monkeys, mice, and bats, and in the process they disburse the seeds widely. Rodents occasionally open and eat the seeds. There are 700 to 1000 seeds/kg when the pericarp is removed (*30*). Seeds for planting are collected shortly after the fruit falls. The pericarp is removed and seeds are sun dried for a few days. The seeds should be sown as soon as practical because they lose their ability to germinate after only 3 months of storage at 4 to 8 °C (*30*).

Seedling Development.—Under suitable conditions, germination takes place in about a month (*7, 9*). If carefully selected fresh seeds are used, germination may be as high as 76 percent, but ordinarily around 50-percent germination is obtained (*30*). Seeds are sown to a depth of about 2.5 cm (*7*).

Several methods of artificial regeneration have been successful. Direct seeding is an effective and convenient practice (*7, 11*). The seeds are bulky, but certainly not as bulky and delicate to handle as seedlings. In east Africa, the use of direct sowing is confined to drier zones, where the use of transplants is too risky (*14*). Stumps (seedlings with the top removed) are also frequently planted (*2, 18, 25*). Seedlings grown in plastic bags or other containers have also been used to establish plantations (*7, 12, 18*). Containerized seedlings should be suitable for field planting when 2 months old, but the use of containerized seedlings has not been referenced in the literature.

Good seed germination coupled with dispersal by various animal agents results in an abundance of seedlings in the forest. Seedlings under dense shade disappear quickly; however, in forest gaps or under a canopy of pioneer species with good filtered light, seedlings may survive and develop. In sufficient sunlight and with adequate moisture, musizi will grow 1 to 3 m during the first season (*7, 9, 25*). Survival of 90 percent at the end of the first year is reported for one stump planting (*25*).

Vegetative Reproduction.—Musizi will coppice (*18*), but the rooting of cuttings or grafting has not been reported in the literature.

Sapling and Pole Stage to Maturity

Growth and Yield.—Although the wood of musizi is desirable, the real popularity of the species depends on its rapid growth rate. Some impressive statistics are reported. In Ghana, plantings 1.5 years old were 6.7 m high (*25*). A dominant height of 15 to 18 m was measured in plantings 5 years old in Malaysia (*18*). A 45-year-old plantation in the wet part of Tanganyika had a mean height of 37 m and d.b.h. of about 1.5 m (*9*). Mean annual height growth of successful plantations usually ranges from about 1.5 to 2.5 m/yr in the first 3 to 8 years. In Puerto Rico, plantings 6 years old averaged 8.6 m high. Diameter increment varies from 1.5 to 5.5 cm/yr (*10*). Total mean annual increment for thinned plots 5 to 10 years old in Malaysia was reported at 22.2 to 33.6 m^3/ha (*18*).

The midrotation crown ratio (crown diameter/d.b.h.) of musizi is 27, higher than most angiosperms. Therefore basal area cannot be allowed to exceed 13.8 m^2/ha if reasonable allowance is to be provided for freedom of crowns (*5*). A sample of codominants in an unthinned volunteer stand in Puerto Rico had an average crown ratio of 26.9 ± 2.2.

Musizi has a strong monopodial growth habit; this coupled with short branch life and rapid natural pruning of dead branches results in a straight, clean, cylindrical bole. The trunk has little or no buttressing.

Rooting Habit.—Seedlings develop a long taproot quickly (*7*). In Puerto Rico, 24-year-old trees growing on clay soil have developed thick lateral roots extending out several meters on the surface of the silty clay soil.

Reaction to Competition.—The ability of the species to colonize grasslands and forest openings (*7, 9, 11*) suggests great resistance to weed and shrub competition. Although musizi cannot compete in very tall, coarse grass sods such as *Pennisetum purpureum* (elephant grass) and *Imperata* spp. after other species begin to invade and shade the grass, musizi seedlings are able to survive (*7*). If an overstory must be killed before planting, it is beneficial to poison the trees up to 3 months in advance (*28*). Once established, musizi will grow without elaborate tending (*9*). The rapid growth, relatively smooth bark, and rapid shedding of branches give the species a special ability to break through competing vines (*17*).

Musizi is reported to be a light-demanding species throughout its life (*25*). In Puerto Rico, however, musizi reproduction has formed understories and midstories of saplings and poles in plantations of pines, eucalyptus, kadam, and *Toona* sp.

Many different spacings have been used for planting musizi. For the taungya system in Ghana, spacings of 1.8 by 2.7 m, 3.7

by 3.7 m, and 5 by 5 m have been used (*25*). Line planting in Sudan has been carried out using an initial spacing of 6 m between lines and 2 m within lines (*11*). For line planting in Fiji, initial spacings of 9 m between lines and 3.6 m within lines have been used (*28*) Triangular spacings based on crown diameters were calculated for best plantation growth in Malaya (*22*). Spacing for trees having a 30.5 cm d.b.h. in fully stocked stands should be 5.7 m between rows and 19.6 m within rows.

Damaging Agents.—A few damaging agents have been reported. In Zaire, a cerambicid beetle, *Monohammus scabiosus*, excavates galleries into pole-sized stems, making the stem liable to snap off during high winds (*7*). In Uganda, a canker may form when the tree is attacked by the pathogenic complex of *Fusarium solani* and *Volutella* sp. (*19*). Young stems 1 or 2 years old may also be affected with "bleeding" bark lesions caused by *Fusarium solani* with an associate bacterium *Leuconostoc mesenteroides*. Affected stems either recover or should be removed during thinnings (*3, 8*). Browsing animals can do considerable damage to seedlings and saplings. Resistance to wind is classed as moderately good (*28*). Untreated wood is not resistant to termites and will decay in contact with the ground or continual moisture (*4, 7*).

SPECIAL USES

The heartwood of musizi is yellow green or green brown turning golden brown on exposure. The sapwood is white. Wood density varies from 0.38 to 0.48 g/cm^3 (*29*). The wood dries fairly rapidly with some warp but little checking. Logs have a tendency to split during felling and storage. The wood saws and machines easily. The high absorbancy of the wood makes it easy to treat with preservatives but difficult to finish. Musizi wood is used in boxes, crates, millwork, plywood, and corestock and for construction lumber (*4*). It is considered a softwood substitute. Pulp made from musizi was found equal to or better than most commonly used temperate hardwood species in bonding and tearing strength (*20*). There appears to be no reason the wood cannot be used for particle and flake boards as well. Bark infusions are used in native medicine as a treatment for a number of ailments (*25*). The species has been used successfully in Uganda as a coffee shade tree (*7*).

GENETICS

Maesopsis is a monotypic genus. The average size attained by the species decreases across Africa from east to west; this is apparently due to the genetic makeup of the genus. In Uganda, the species commonly reaches 27 to 37 m high (*7*) while in Nigeria the trees seldom exceed 15 m in height (*4*).

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